CLAIMS

I CLAIM:

1. A thermal-assisted magnetic memory storage device comprising:

a cross point array of magnetic tunnel junction memory cells, the memory cells comprising a material wherein the coercivity is decreased upon an increase in temperature;

a plurality of separate looping write conductors positioned within close proximity about each magnetic tunnel junction memory cell.

2. The thermal-assisted magnetic memory storage device of claim 1, wherein the looping write conductors are not in electrical contact with the memory cells.

3. The thermal-assisted magnetic memory storage device of claim 1, wherein the magnetic tunnel junction memory cells are offset.

4. The thermal-assisted magnetic memory storage device of claim 1, wherein a bias current passing through a given memory cell causes localized warming within the given memory cell.

5. A thermal-assisted magnetic memory storage device comprising:

a plurality of parallel electrically conductive rows;

a plurality of parallel electrically conductive columns transverse to the rows, the columns and rows thereby forming a cross point array with a plurality of intersections;

a plurality of offset magnetic tunnel junction memory cells, each memory cell located proximately to and in electrical contact with an intersection between a row and column, the memory cells comprising a material with an alterable orientation of magnetization, wherein the coercivity of the alterable material is decreased upon an increase in temperature; and

a plurality of separate looping write conductors positioned within close proximity about each magnetic tunnel junction memory cell.

6. The thermal-assisted magnetic memory storage device of claim 5, wherein the looping write conductors are not in electrical contact with the memory cells.

7. The thermal-assisted magnetic memory storage device of claim 5, wherein the looping write conductors further comprise a ferromagnetic cladding.

8. The thermally-assisted magnetic memory storage device of claim 5, wherein during a write operation;

a bias current is applied to a given magnetic tunnel junction memory cell by a given conductive row and a given conductive column, the bias current warming the given magnetic tunnel junction memory cell;

a write magnetic field is generated by a current flowing in the write conductor, the looping nature of the conductor about the given magnetic tunnel junction memory cell doubling the write magnetic field saturating the given magnetic tunnel junction memory cell;

wherein the orientation of magnetization of the material may be changed, the magnetic field provided by the write conductor being greater than the coercivity of the heated material.

9. The thermal-assisted magnetic memory storage device of claim 5, wherein the offset magnetic tunnel junction memory cell is joined to the conductive row by a thin top conductor and joined to the conductive column by a thin bottom conductor, the top and bottom conductors laterally displacing the magnetic tunnel junction memory cell from the cross point axis.

10. The thermal-assisted magnetic memory storage device of claim 9, wherein the lateral displacement of the memory cell positions the top and bottom of the memory cell substantially between the loops of the write conductor.

11. The thermal-assisted magnetic memory storage device of claim 5, wherein the plurality of looping write conductors run parallel to the conductive rows.

12. The thermal-assisted magnetic memory storage device of claim 5, wherein the plurality of looping write conductors run parallel to the conductive columns.

13. The thermal-assisted magnetic memory storage device of claim 5, wherein each memory cell further includes a reference layer characterized by a pinned orientation of magnetization.

14. The thermal-assisted magnetic memory storage device of claim 5, wherein each memory cell further includes a soft ferromagnetic reference layer, the soft reference layer having a non-pinned orientation of magnetization.

15. A thermal-assisted magnetic memory storage device comprising:

a plurality of parallel electrically conductive rows;

a plurality of parallel electrically conductive columns transverse to the rows, the columns and rows thereby forming a cross point array with a plurality of intersections;

a plurality of offset magnetic tunnel junction memory cells, each memory cell located proximately to and in electrical contact with an intersection between a row and column, each memory cell including;

a top offset electrical conductor joined to the row and extending substantially transversely from the row for a length at least the width of the memory cell;

at least one ferromagnetic data layer characterized by an alterable orientation of magnetization, the ferromagnetic data layer comprising a material wherein the coercivity is decreased upon an increase in temperature;

an intermediate layer in contact with the data layer;

a ferromagnetic reference layer in contact with the intermediate layer, opposite from the data layer;

a bottom offset electrical conductor parallel to and of substantially the same length as the top offset conductor, the bottom offset conductor joined to the column;

wherein the top and bottom offset conductors laterally offset the top and bottom of the memory cell from the cross point of the row and column, the bottom offset conductor additionally vertically offsetting the memory cell from the column; and

a plurality of separate looping write conductors positioned within close proximity to the top and bottom offset conductors of each memory cell, the looping write conductors substantially in line with the laterally offset magnetic tunnel junction memory cells.

16. The thermal-assisted magnetic memory storage device of claim 15, wherein the looping write conductors are not in electrical contact with the memory cells.

17. The thermal-assisted magnetic memory storage device of claim 15, wherein the looping write conductors further comprise a ferromagnetic cladding.

18. The thermally-assisted magnetic memory storage device of claim 15, wherein during a write operation;

a bias current is applied to a given magnetic tunnel junction memory cell by a given conductive row and a given conductive column, the bias current warming the given magnetic tunnel junction memory cell;

a write magnetic field is generated by a current flowing in the write conductor, the looping nature of the conductor about the given magnetic tunnel junction memory cell doubling the write magnetic field saturating the given magnetic tunnel junction memory cell;

wherein the orientation of magnetization of the material may be changed, the magnetic field provided by the write conductor being greater than the coercivity of the heated material.

19. The thermal-assisted magnetic memory storage device of claim 15, wherein the lateral displacement of the memory cell positions the top and bottom of the memory cell substantially between the loops of the write conductor.

20. The thermal-assisted magnetic memory storage device of claim 15, wherein the plurality of looping write conductors run parallel to the conductive rows.

21. The thermal-assisted magnetic memory storage device of claim 15, wherein each memory cell further includes a reference layer characterized by a pinned orientation of magnetization.

22. The thermal-assisted magnetic memory storage device of claim 15, wherein each memory cell further includes a soft ferromagnetic reference layer, the soft reference layer having a non-pinned orientation of magnetization.

23. A computer system comprising:

a main board;

at least one central processing unit (CPU) joined to the main board;

at least one thermal-assisted magnetic memory store joined to the CPU by the main board, thermal-assisted magnetic memory including:

a plurality of parallel electrically conductive rows;

a plurality of parallel electrically conductive columns transverse to the rows, the columns and rows thereby forming a cross point array with a plurality of intersections;

a plurality of offset magnetic tunnel junction memory cells, each memory cell located proximately to and in electrical contact with an intersection between a row and column, the memory cells comprising a material with an alterable orientation of magnetization, wherein the coercivity of the alterable material is decreased upon an increase in temperature; and

a plurality of separate looping write conductors positioned within close proximity about each magnetic tunnel junction memory cell.

24. The thermal-assisted magnetic memory storage device of claim 23, wherein the looping write conductors are not in electrical contact with the memory cells.

25. The thermally-assisted magnetic memory storage device of claim 23, wherein during a write operation;

a bias current is applied to a given magnetic tunnel junction memory cell by a given conductive row and a given conductive column, the bias current warming the given magnetic tunnel junction memory cell;

a write magnetic field is generated by a current flowing in the write conductor, the looping nature of the conductor about the given magnetic tunnel junction memory cell doubling the write magnetic field saturating the given magnetic tunnel junction memory cell;

wherein the orientation of magnetization of the material may be changed, the magnetic field provided by the write conductor being greater than the coercivity of the heated material.